



University at Buffalo

Department of Civil, Structural
and Environmental Engineering

School of Engineering and Applied Sciences

Environmental and Water Resources Engineering Seminar

Understanding Water-Energy-Ecology Nexus from An Integrated Earth-Human System Perspective

Abstract

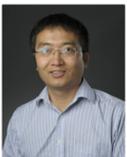
Both Earth and human systems exert notable controls on streamflow and stream temperature that influence energy production and ecosystem health. An integrated water model representing river processes and reservoir regulations has been developed and coupled to a land surface model and an integrated assessment model of energy, land, water, and socioeconomics to investigate the energy-water-ecology nexus in the context of climate change and water management. Simulations driven by two climate change projections following the RCP 4.5 and RCP 8.5 radiative forcing scenarios, with and without water management, are analyzed to evaluate the individual and combined effects of climate change and water management on streamflow and stream temperature in the U.S. The simulations revealed important impacts of climate change and water management on hydrological droughts. The simulations also revealed the dynamics of competition between changes in water demand and water availability in the RCP 4.5 and RCP 8.5 scenarios that influence streamflow and stream temperature, with important consequences to thermoelectricity production and future survival of juvenile Salmon. The integrated water model is being implemented to the Accelerated Climate Modeling for Energy (ACME), a coupled Earth System Model, to enable future investigations of the energy-water-ecology nexus in the integrated Earth-Human system.

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Dr. Hongyi Li is an Associate Professor in the Land Resources and Environmental Sciences department at MSU. He earned his Ph.D. in watershed hydrology in 2010 at University of Urbana-Champaign. Before joining MSU in 2016, he spent 6 years in the Pacific Northwest National Laboratory as a postdoc then research scientist. His research interests include hydrological and biogeochemical modeling and analysis at the watershed and larger scales in view of land as hierarchical watersheds and river systems with intertwined natural and societal functions. Specific interests include developing novel modeling and data analysis tools to understand lateral transport of water, energy and biogeochemistry fluxes across land surface and through river systems under climate and human-induced changes and pursuing the understanding and representing of two-way interactions and feedbacks between Human and Earth Systems within the climate-water-energy-environment nexus.

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Location: 223 Jarvis Hall, North Campus, University at Buffalo